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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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John Kevin McCoy

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EXAMINER

TSOY, ELENA

ART UNIT

PAPER NUMBER

1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/692,646

Applicant(s)

MCCOY, JOHN KEVIN

Examiner

Elena Tsoy

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 13-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>1/04; 1/06</u> | 6) <input type="checkbox"/> Other: _____ |

Election/Restrictions

1. Applicant's election of Group I, claims 1-12, in the reply filed on 12/21/2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 13-16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Objections

2. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 3 is identical to claim 1 on which it depends.

3. Claim 9 is objected to because of the following informalities: "method is repeated until a thermal conductivity is increased at least 5% compared to a fuel arrangement from pure uranium dioxide" should be changed to the method is repeated until a thermal conductivity is increased at least 5% compared to that of a fuel arrangement from pure uranium dioxide" because thermal conductivity of impregnated product cannot be compared to a fuel arrangement.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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5. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for increased thermal conductivity of 50 % for a 10 % volume loading of silicon carbide (See specification, page 6, lines 3-4), does not reasonably provide enablement for **at least** 5% increase compared to that of a fuel arrangement from pure uranium dioxide. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 recites "a fuel arrangement from pure uranium dioxide" which renders the claim indefinite because the meaning of "**pure** uranium dioxide" is not clear. For examining purposes the phrase was interpreted as "untreated uranium dioxide"

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3-4, 9, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Feraday (US 4,020,131).

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Feraday discloses a method for producing uranium dioxide fuel comprising providing a pellet of uranium dioxide (claimed porous UO_2 arrangement); impregnating the pellet with a solution of plutonium nitrate (claimed precursor liquid); and heating the impregnated pellet at $1400\text{-}1700^\circ\text{C}$ to convert the precursor into plutonium oxide (claimed second phase) (See column 1, lines 52-60).

10. Claims 1, 3-4, 9, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by GB1228317A.

GB 1228317A discloses a method for producing uranium dioxide fuel comprising providing a "green" pellet of uranium dioxide (claimed porous UO_2 arrangement) (See page 1, lines 53-57); impregnating the pellet with a solution of plutonium nitrate (claimed precursor liquid) (See page 1, lines 43-46); and heating the impregnated pellet (See page 1, lines 73-76) to convert the precursor into plutonium oxide (claimed second phase) (See page 1, lines 46-48).

11. Claims 1, 3-4, 9, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee (US 4,110,159).

Lee discloses a method for producing uranium dioxide fuel comprising providing a porous body compact (See column 3, lines 4-5) of uranium dioxide (claimed porous UO_2 pellet) (See column 4, lines 37-38); impregnating the pellet (See column 1, lines 3-32) with a solution of plutonium nitrate (claimed precursor liquid) (See column 4, lines 37-45); and heating the impregnated pellet to convert the precursor into plutonium oxide (claimed second phase) (See column 4, lines 54-64).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1, 3-9, 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB1035789 in view of Carley-Macaulay et al (US 3164487).

GB '789 discloses a method of producing a nuclear fuel body with very low permeability to gases (See page 1, lines 13-14) comprising impregnating a porous body comprising nuclear fuel element, e.g. uranium carbide (See column 2, lines 43-44) with a polymerizable substance such as furfuryl alcohol (See column 3, lines 125-129) or furfural (See column 4, lines 39-40) by immersing the nuclear fuel body in a bath of the polymerizable substance (See column 4, lines 72-80), curing at temperature of 60-100⁰C or **higher** depending on particular polymerizable substance utilized (See column 4, lines 110-117), then carbonizing the cured impregnant at temperature which depends on the impregnant and the desired carbonization rate (See column 5, lines 14-20); and **repeating** the impregnating, curing and carbonizing until the desired low gas permeability is achieved (See column 1, lines 27-34).

GB '789 fails to teach that uranium dioxide is used instead of uranium carbide (Claim 1).

Carley-Macaulay et al teach that uranium dioxide or uranium carbide can be used as a nuclear fuel element (See column 2, lines 61-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used uranium dioxide instead of uranium carbide in GB '789 with the

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expectation of providing the desired nuclear fuel body with very low permeability to gases since Carley-Macauly et al teach that uranium dioxide or uranium carbide can be used as a nuclear fuel element.

As to claims 6-8, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant temperature parameters (including those of claimed invention) in the cited prior art through routine experimentation in the absence of showing criticality.

As to claim 9, obviously the shape of body could be of any form known in the art including pellets.

As to claim 11, it is the Examiner's position that the a nuclear fuel body of the cited prior art would have claimed properties since it is prepared by a method substantially identical to that of claimed invention.

14. Claims 1, 3-9, 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carley-Macauly et al (US 3164487) in view of Nicholson et al (US 3, 035,325) and Mysels (US 4,073,834).

Carley-Macauly et al disclose a method of producing carbon-impregnated nuclear fuel element with very low permeability to gases (See column 1, lines 11-16) comprising impregnating a porous artefact having high open porosity and low thermal conductivity (See column 1, lines 20-21) such as nuclear fuel material (See column 3, lines 5-10), e.g. uranium dioxide (claimed porous uranium dioxide arrangement) (See column 1, lines 62, 66-67) or a porous silicon carbide (See column 3, lines 33-34) or porous silica or alumina (See column 2, lines 33-34) by pyrolysis of methane and other hydrocarbons (See column 4, lines 21-45).

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Carley-Macauly et al fail to teach that carbon is impregnated by infiltrating a liquid carbon precursor (Claim 1).

Nicholson et al teach that carbon can be deposited in the pores of substantially *any* refractory body having intercommunicating network by any available technique (See column 6, lines 10-16) such as pyrolysis of methane and other hydrocarbons (See column 6, lines 20-21) and impregnation of the porous body with phenol-formaldehyde based resinous solution (See column 5, lines 63-70) or furfural or -the like, followed by carbonization by acidification (See column 6, lines 21-22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have deposited carbon in the cited prior art using impregnation technique with a liquid precursor instead of pyrolysis of methane and other hydrocarbons since Nicholson et al teach that these techniques are functionally equivalent to each other for depositing carbon in the pores of substantially *any* refractory body having intercommunicating network.

Carley-Macauly et al in view of Nicholson et al fail to teach that the impregnated liquid carbon precursor is converted to carbon by curing and firing the arrangement (Claim 2); curing at temperature of 180-400⁰C (Claim 6) and firing at temperature of 850-1700⁰C (Claim 7) or 1500-1700⁰C (Claim 8).

Mysels teaches that carbon can be deposited in the pores in a fuel arrangement (See column 3, lines 50-65) from impregnant such as phenol-formaldehyde prepolymer (See column 4, 112-13) or furfuryl alcohol monomer/prepolymer (See column 4, lines 5-8) by **curing** first the prepolymer (See column 4, lines 10-12) and decomposing the cured polymer at temperature of

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200-800°C (See column 4, lines 35-37) and carbonizing at 1200°C or **higher** (claimed firing) (See column 4, lines 33-34).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have impregnated a porous body of Carley-Macaulay et al in view of Nicholson et al with phenol-formaldehyde prepolymer or furfuryl alcohol monomer/prepolymer precursor followed by curing/decomposing at 200-800°C and carbonizing at 1200°C or **higher** with the expectation of providing the desired deposited carbon in the pores of a body, as taught by Mysels.

Moreover, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant temperature parameters (including those of claimed invention) in the cited prior art through routine experimentation in the absence of showing criticality.

As to claim 9, obviously the shape of body could be of any form known in the art including pellets.

As to claim 11, Carley-Macaulay et al teach that thermal resistance depends on thickness of carbon deposit (See column 1, lines 41-47). The permeability to gases of carbon impregnated body would also depend on a thickness of carbon deposit. It is a well-known principle to reapply a coating to achieve a desired thickness of a final coating depending on intended use of the final coated product. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have re-applied a carbon in the cited prior art according to well-known principle, with the expectation of providing the desired thickness of a final coating.

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It is the Examiner's position that the a nuclear fuel body of the cited prior art would have claimed properties since it is prepared by a method substantially identical to that of claimed invention.

15. Claims 2 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB '789 in view of Carley-Macaulay et al/Carley-Macaulay et al in view of Nicholson et al and Mysels/, and further in view of Burnham et al (US 3,129,141) and Chayka (US 5952046).

The cited prior art are applied here for the same reasons as above. The cited prior art fails to teach that silicon carbide is used instead of carbon (Claim 10).

Burnham et al teach that some of the ideal characteristics sought in a nuclear reactor fuel element are: good thermal conductivity, high heat resistance and heat shock resistance, corrosion resistance, high mechanical strength even at elevated temperatures (See column 1, lines 14-18), and comprises a dense body comprising uranium carbide, graphite, silicon carbide (See column 1, lines 33-36). In other words, Burnham et al teach that silicon carbide may be used for making a dense body of a nuclear reactor fuel element. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have impregnated a porous nuclear reactor fuel body in the cited prior art with silicon carbide instead of carbon with the expectation of providing the desired dense body because Burnham et al teach that silicon carbide may be used for making a dense body of a nuclear fuel element.

The cited prior art fails to teach that silicon carbide is impregnated from a polymerizable allylhydridopolycarbosilane (Claim 2).

Chayka teaches that a liquid allylhydridopolycarbosilane (AHPCS) is a commercially available HPCS known in the art as silicon carbide source (See column 9, lines 22-42).

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used allylhydridopolycarbosilane as a liquid precursor in the cited prior art with the expectation of providing the desired SiC impregnated nuclear fuel body since Chayka teaches that a liquid allylhydridopolycarbosilane (AHPCS) is a commercially available HPCS known in the art as silicon carbide source.

16. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carley-Macaulay et al in view of Nicholson et al and Mysels, and further in view of GB '789.

The cited prior art are applied here for the same reasons as above. The cited prior art fails to teach repeating the steps of impregnating, curing and carbonizing.

GB '789 teaches that the desired low gas permeability is achieved by repeating the steps of impregnating, curing and carbonizing (See column 1, lines 27-34).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have repeated the steps of impregnating, curing and carbonizing in the cited prior art with the expectation of providing the desired low gas permeability, as taught by GB '789.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy whose telephone number is 571-272-1429. The examiner can normally be reached on Monday-Thursday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-142323. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy
Primary Examiner
Art Unit 1762

ELENA TSOY
PRIMARY EXAMINER
ETsoy

January 17, 2007